Radiology Case Reports 15 (2020) 775–779

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

# Trifurcation of the right common carotid artery—Case report

*Kinga Szymańska, MD*[a], *Patryk Pozowski, MD*[b,*], *Paula Misiak, MD*[c], *Rafał Mazur, MD*[d], *Jurand Silicki, MD*[e], *Małgorzata Sierpowska, MD*[f], *Aleksander Pawluś, PhD*[g], *Urszula Zaleska-Dorobisz*[h]

[a] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Wrocław, Poland*
[b] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Curie-Skłodowskiej 68, 50-369, Wrocław, Poland*
[c] *Uniwersytecki Szpital Kliniczny im. Jana-Mikulicza Radeckiego we Wrocławiu, Wrocław, Poland*
[d] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Wrocław, Poland*
[e] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Wrocław, Poland*
[f] *Wojewódzki Szpital Specjalistyczny w Legnicy, Zakład Radiologii, Wrocław, Poland*
[g] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Wrocław, Poland*
[h] *Uniwersytet Medyczny im. Piastów Śląskich we Wrocławiu, Zakład Radiologii Ogólnej i Pediatrycznej, Wrocław, Poland*

ARTICLE INFO

*Article history:*
Received 15 February 2020
Revised 5 March 2020
Accepted 6 March 2020

*Keywords:*
Carotid artery
Trifurcation
Common carotid artery
Rare anatomical variant

ABSTRACT

Trifurcation is rare anatomical variant of the common carotid artery (CCA) termination. Knowledge of such alteration may prevent from the unintentional complications and influence on the course of various invasive medical procedures carried in the neck region. The best way to assess anatomy of neck arteries is computed tomography angiography (CTA). In this article we present a case of 64-year old male patient, who was admitted to the department with a chronic headaches and dizziness. CTA revealed a trifurcation of the right common carotid artery into: internal carotid artery and two branches of external carotid artery. The aneurysm of the proximal part of Vertebral Artery was also observed and it was considered as a cause of the symptoms which should not be related to the anatomical variety of the CCA.



* Corresponding author.
E-mail address: patrykpozowski@gmail.com (P. Pozowski).
https://doi.org/10.1016/j.radcr.2020.03.011

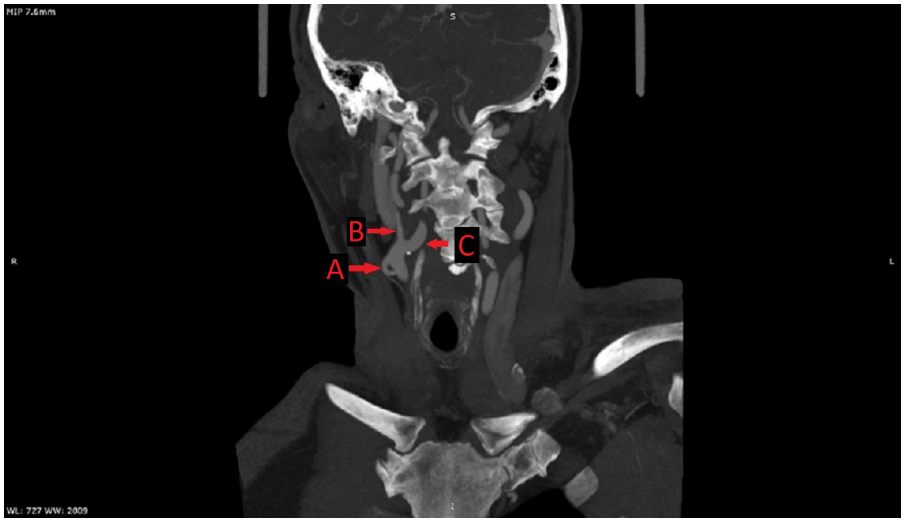


**Fig. 1 – (A) First branch of the right external carotid artery, (B) Second branch of the right external carotid artery, (C) Internal carotid artery.**

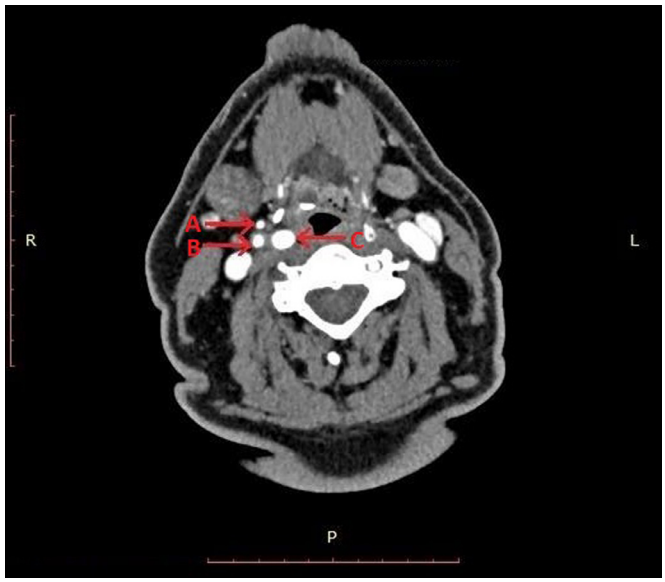


**Fig. 2 – (A) First branch of the right external carotid artery, (B) Second branch of the right external carotid artery, (C) Internal carotid artery.**

## Background

The common carotid artery is a paired structure that supplies blood to the head and neck. The right common carotid originates in the neck from the brachiocephalic trunk while the left from the aortic arch in the thorax. Usually the common carotid artery bifurcates into an internal carotid artery and an external carotid artery (ECA). That normally happens at approximately the level of the fourth cervical vertebra. The ECA begins at the upper border of thyroid cartilage, and curves, passing forward and upward, and then inclining backward to the space behind the neck of the mandible, where it divides into the superficial temporal and maxillary artery within the parotid gland. Along its ascent the ECA gives off 6 branches: superior thyroid, lingual, facial and occipital, ascending pharyngeal and posterior auricular arteries [1]. However, some various abnormalities of the common carotid artery and the ECA may occur. Here we report a case of trifurcation of right common carotid artery into internal carotid artery and 2 external carotid arteries.

## Case

A 64-year old male patient was admitted to the department with a dizziness and chronic headaches. The patient was a longtime hypertensive. The neurological examination didn't reveal any deviation. Doppler ultrasonography of the carotid

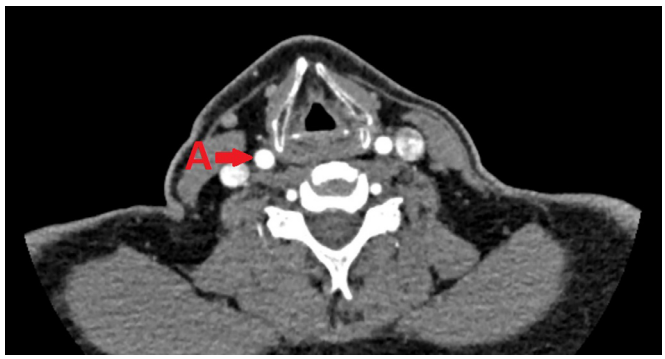


**Fig. 3 – (A) Right common carotid artery before the branching**

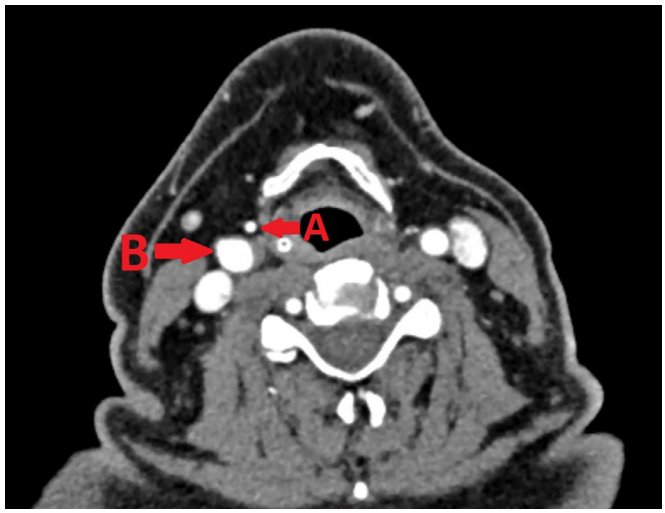


**Fig. 4 – (A) First branch of the right external carotid artery, (B) Right common carotid artery**

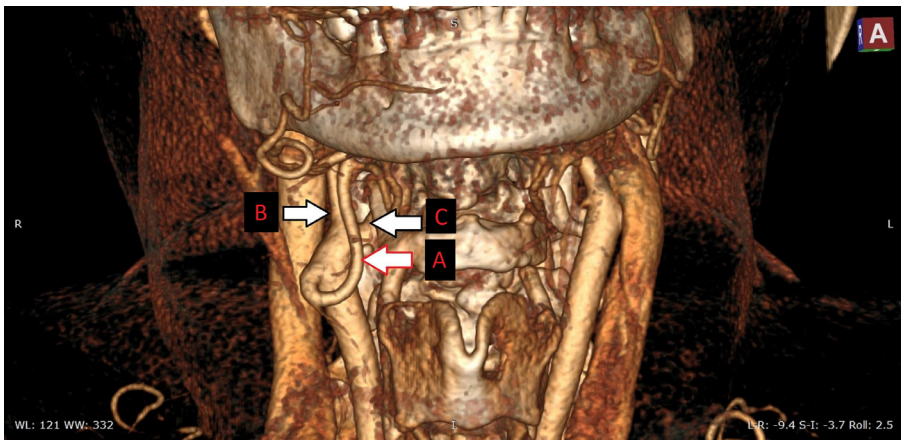


**Fig. 5 – (A) First branch of the right external carotid artery, (B) Second branch of the right external carotid artery, (C) Internal carotid artery.**

arteries was performed as a further diagnostic process. The Doppler US disclosed a possible trifurcation of the right common carotid artery.

For specified examination, computed tomography angiography was performed using a 320 row computed tomography scanner with a contrast medium including 400 mg/ml of iodine with a flow of 4.5 ml/second. Scan affirmed trifurcation of the right common carotid artery (Figure 1, 2, 3, 4, 5 and 6). That was located at the level of intervertebral disc between fourth and fifth cervical vertebras. In contrast, the left com-

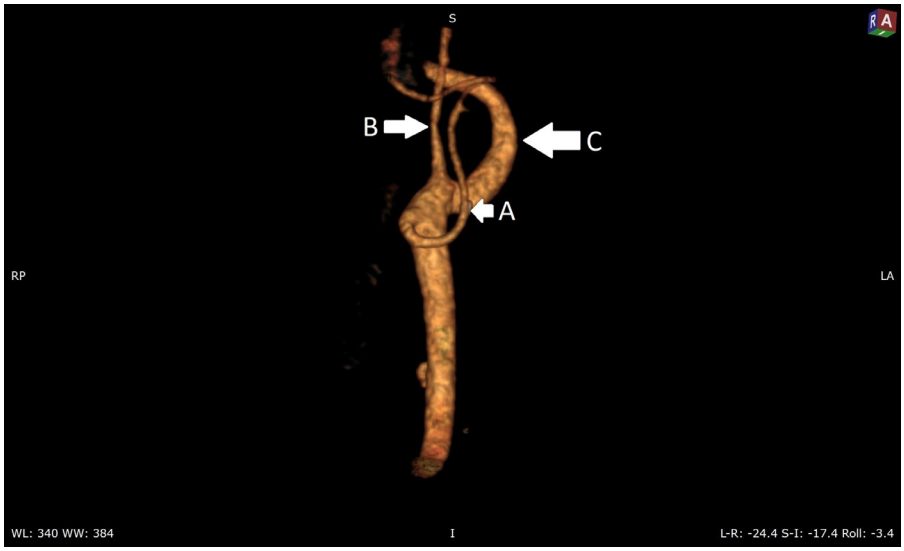


**Fig. 6 – (A) First branch of the right external carotid artery, (B) Second branch of the right external carotid artery, (C) Internal carotid artery.**

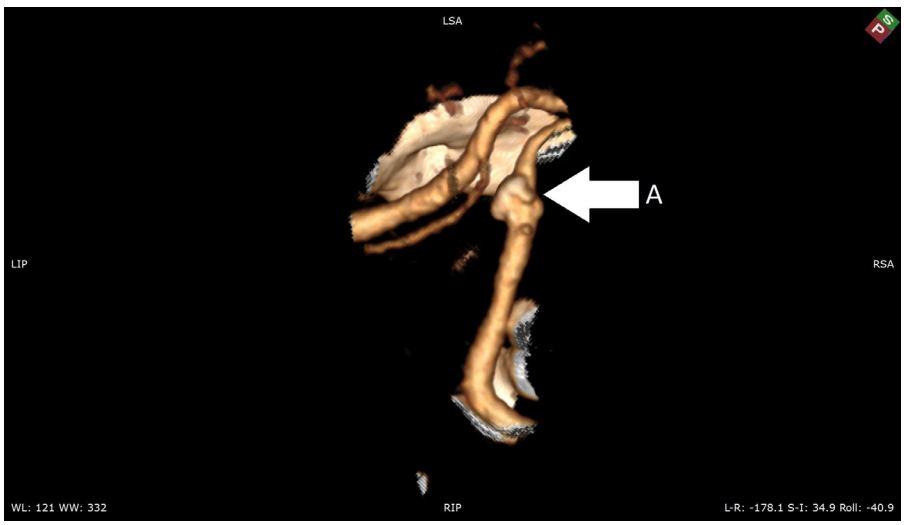


**Fig. 7 – (A) Aneurysm of the vertebral artery.**

mon carotid artery terminated higher, at the level of fourth cervical vertebra. First branch of the right common carotid artery arose forward at the level of the inferior margin of the hyoid bone, further ascended and led medially. At the level of mandible divided into lingual and maxillar artery. Afterwards, the carotid common artery bifurcated at the level of the fourth cervical vertebras. One of them terminated into superficial temporal and maxillary arteries. Second ran as the internal carotid artery.

Another finding in computed tomography angiography was the aneurysm of the proximal part of Vertebral Artery (Fig. 7) and it was supposed as a possible reason of clinical signs. However the patient refused any surgical treatment and he was discharged from a hospital with a highly recommended check-up after 6 months.

## Discussion

In researches there were revealed multiple variations in course of the carotid common artery and its branches. The atypical origins and courses of the ECA were reported, as well as absence of the common carotid artery and the trifurcation of the common carotid artery [1–4]. In our case the right common carotid artery trifurcated at the lower level in comparison to the left common carotid artery. The right common carotid artery divided into the internal carotid artery, the ECA and the linguo-facial trunk. Included past reasearches the presence of the linguo-facial trunk was observed by Lucey [3] et al in 20%, by Lappas [5] et al in 14%, by Ozgur [6] in 7,5% of cases. Nevertheless, the another option of trifurcation of the common

carotid artery was noted such as dividing into the internal carotid artery, the ECA and the facial artery [7]. Another case showed terminating of the common carotid artery as the internal carotid artery, the ECA and the occipital artery [1].

## Conclusion

The knowledge of the origin and course of the vessels is essential for proper arrangement of various medical procedures in the neck region such as carotid endoplasty for the treatment of carotid stenosis or extracranial-intracranial arterial bypass for the treatment of patients with occlusive cerebrovascular disease, skull-base tumors or aneurysms [8]. The diagnostic imaging could be most helpful in assessment of the anatomical variant and potential complications. The angiography is the best way to assess vascular anatomy.

REFERENCES

[1] Chitra R. Trifurcation of the right common carotid artery. Indian J Plast Surg 2008;41(1):85–8. doi:10.4103/0970-0358.41121.

[2] Gürbüz J, Çavdar S, Özdoğmuş Ö. Trifurcation of the left common carotid artery: a case report. Clin Anat 2001;14(1):58–61. doi:10.1002/1098-2353(200101)14:1⟨58::AID-CA1011⟩3.0.CO;2-M.

[3] Lucev N, Bobinac D, Maric I, Drescik I. Variations of the great arteries in the carotid triangle. Otolaryngol Head Neck Surg 2000;122(4):590–1. doi:10.1067/mhn.2000.97982.

[4] Cakirer S, Karaarslan E, Kayabali M, Rozanes I. Separate origins of the left internal and external carotid arteries from the aortic arch: MR angiographic findings. Am J Neuroradiol 2002;23(9):1600–2.

[5] Lappas DA, Kamberos SP, GIsakis IG, Takis CH, Lykaki G. Anatomic study of the variations in the origin of the branches of the external carotid artery. Beta Medical Arts 2002;81:28–31.

[6] Ozgur Z, Govsa F, Ozgrs T. Assessment of origin of characteristics of the front branches of ECA. J Cranio Fac Surg 2008;19(4):1159–66. doi:10.1097/SCS.0b013e3180690252.

[7] Altinbas N, Unal S, Peker A, Uzun C, Akkaya Z, Peker E. Trifurcation of the Left Common Carotid Artery. Pol J Radiol 2015;80:376–8. doi:10.12659/PJR.894579.

[8] Quadros L, Pandey A, D'souza A. Anatomical variations in the arteries and nerves of the right carotid triangle. Online J Health Allied Sci 2014;13(2):3.